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(54) EXTRUDED EDGE PROTECTOR TRIM STRIP

(71) We, SCHLEGEL (UK) LIMITED, a British Company, of Ring Road, Seacroft, Leeds, LS14 1LY, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to multi-grade edge protector trim strips and door aperture sealing strips for use on motor vehicles, which are coloured to match the paintwork or upholstery of the vehicle, and which are extruded from at least two different thermosetting materials.

An advantage of the present invention is that it is possible to produce relatively cheaply what appear to be coloured edge protector trim strips, in that the outer layer of the extrusion can be specially coloured whereas the main body of the extrusion can be of traditional material. Likewise, it is possible with the present invention to make extrusions in which the surface of the strip is of one grade and hence surface finish, whereas the body of the extrusion is of a much cheaper grade of thermosetting material. A further advantage of the apparatus described herein is that it is possible to change the material of the outer layer merely by changing the supply of that material, thus making a colour change possible, or it is even possible to shut off the supply of that material altogether, and provide a traditional trim strip of the cheaper, normally black rubber material. This "changing over" can be done on a continuous basis without stopping the extrusion apparatus.

Traditionally, edge protector trim strips and door sealing strips for use in motor vehicles have been made of plastics material which is easier to extrude than rubber material because the latter has to be vulcanised. Often the plastics material has had a sponge rubber sealing extrusion connected to it, but this means two extrusion processes are required, followed by a combining process. Furthermore, for motor vehicle door seals, corners have to be formed, and although the plastics extrusion can have heat sealed corners, the rubber has to be vulcanised. This again involves two processes. A further disadvantage of a door seal formed at least partly of plastics, i.e. thermoplastics material, is that this plastics material can become damaged when a vehicle, to which the strip has been fitted, has to be passed through a paint touch-up oven.

For several years now, the motor industry has expressed a desire for specially coloured trim strips to match the upholstery within the vehicle. Manufacturers have been striving for years to meet this requirement but most attempts have been unsuccessful. Coloured plastic strips are now being used, but plastics is going out of favour, for the reasons mentioned above, and also because it is expensive. Attempts have also been made to produce coloured rubber trim strips. Traditionally, rubber trim strips are made of neoprene or EPDM, but it has proved difficult if not impossible to extrude such material in bright colours and invariably colour matches have proved impossible. With EPDM, there are considerable complications in the mixing of the pigments with the material, especially since Banbury mixers are normally used and it is almost impossible to keep the carbon black from the normal rubber blends from contaminating specially coloured mixes.

One prior art proposal for obtaining coloured edge protector trim strips has been to paint the normal black rubber extrusion. This, however, involves very high capital investment as the extruded black rubber material has to be cleaned by washing in caustic soda and then distilled water. It is then either passed through an ultra violet light bath to release ozone or treated in an ozone chamber and then passed through a painting line to prime it with a coupling agent and is then baked, and finally passed through a further paint line for its top coat, which is then baked on. Needless to day, the additional cost in the end product has proved prohibitive. Furthermore, trim strips

are usually manufactured on a continuous basis, and to date the present method of cleaning the surface, treating, priming, baking, followed by application of the top coat paint, and subsequent "stoving" of the paint does not lend itself to a continuous process.

We have now discovered, however, that it is possible, using our knowledge of extruding, to manufacture multi-grade, e.g. "coloured" rubber trim strips in a continuous process quite cheaply, by extruding a coloured PVC/Nitrile or HYPALON (R.T.M.) rubber as an outer covering and by providing the main body of the extrusion of EPDM, or other polymers such as SBR, Neoprene or Natural rubber which can include as much as 60% fillers. HYPALON is a very high quality thermosetting polymeric material which, with the use of pigments, can easily be coloured and after extrusion it exhibits the same glossiness as can be obtained with painting.

Because the outer covering of coloured rubber, which is very expensive, can be made very thin, only a very small amount need be used and the main body can be of cheap material with the result that an economical edge protector trim strip/door seal can be provided which meets the colour requirements of the industry.

According to the present invention, we provide an edge protector trim strip for fitting around a flange on a motor vehicle, the strip having a generally U-shaped cross section and being extruded in one piece from at least two resiliently deformable, polymeric thermosetting materials, one of which forms a major portion of the strip and is arranged, in use, around said flange, and the other of which is of a different colour from said one material, and extends over at least part of the outer surface of said U-shaped strip.

Preferably, the first material surrounds a resiliently deformable metallic carrier.

Preferably, the outer surface is formed of a high grade material such as PVC/Nitrile or HYPALON which may be coloured by pigments, whereas the first material is a cheaper material such as EPDM or other polymer which may include up to 60% by weight of fillers.

Preferably, a sealing portion extends from an edge portion of the trim strip. This sealing portion may be formed of a third material of a thermosetting polymeric nature. The trim strip may be initially extruded in a generally L-shaped configuration, the longer arm of the L subsequently being deformed to provide a generally U-shaped configuration so that the second material provides the whole of the outer surface of the U except when a sealing portion is provided.

Preferably, one or more inwardly directed gripper fins are provided on the inner surface of the extrusion, these fins being extruded with and attached to the flange embracing surface of the second material. It is even envisaged that the traditional gripper fins incorporated in edge protector trim strips can be formed f a yet further material. It will also be appreciated that different fin formations are possible.

Also according to the present invention, we provide a method of, and an extrusion die for, producing an edge protector trim strip as described and claimed herein.

The present invention is now described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a schematic representation of an extruder for forming a rubber edge protector trim strip with an integral rubber seal;

Figure 2 is an end elevation of an extrusion die for the extruder of Figure 1 showing the strip being extruded therefrom;

Figure 3 is a section on the line A–A of Figure 2;

Figure 4 is an exploded oblique drawing of an upstream die plate of the die shown in Figure 3, together with an extruder flow cone, and the portion of an extrusion which is formed by the die plate;

Figure 5 is a section on the line C–C of Figure 4;

Figure 6 is an oblique drawing of the central die plate shown in Figure 3, together with a portion of the extrusion which emits from the die plate when the plate is attached to the plate shown in Figures 4 and 5;

Figure 7 is a section on the line B–B of Figure 6.

Figure 8 is an oblique drawing of the downstream die plate of Figure 3, together with a portion of the extrusion which emits from the die plate when it is attached to the die plate shown in Figures 4–7;

Figure 9 is a section on the line D–D of Figure 8, and

Figure 10 is an oblique drawing in section to an enlarged scale of the extrusion shown in Figure 9 after it has been shaped ready to apply to a flange.

Referring to Figure 10 of the drawings, the strip shown therein is of a generally well-known shape incorporating a U-shaped rubber edge protecting and trim portion 1 to which is integrally attached a generally hollow sealing portion 3. The sealing portion 3 may be made of closed cell sponge rubber. The portion 1 has a generally U-shaped carrier 5 which may be of known construction, e.g. a zig-zag wire carrier, into which warp strands are knitted, or slotted metal, and this is embedded in a relatively cheap rubber material 7, e.g. of EPDM, with a high percentage of fillers. Two gripper fins 9 extending inwardly of the U project from each of the arms of the U in known manner (other arrangements are possible, e.g. two small fins on the arm carrying the portion 3, and one larger fin on the opposite arm) and a major part of the outer surface 11 of the portion 1 is formed of a special rubber material such as PVC/Nitrile or HYPALON. This material is

extruded with the remainder of the strip and can be chosen to meet the customer's requirements, whereas of course the cheap rubber material 7, provided it functions satisfactorily, can be of a much inferior quality. For example, the outer surface 11 can be a shiny grade coloured rubber, whereas the material 7 can be a cheaper rubber such as EPDM, SBR, Neoprene or Natural rubber. However, it should be compatible with the PVC/Nitrile or HYPALON to ensure a satisfactory bond between the two rubbers.

If desired, the sealing portion 3 may be omitted, in which case the outer surface 11 could extend wholly around the outer periphery of the trim strip.

It is envisaged that the present invention can be applied to any extruded edge protector trim strip, the exterior appearance of which has to meet specific requirements, provided the extruded materials are of a thermosetting polymeric nature. For example, the invention could be applied to dual durometer extruded rubber trim strips having a cheap internal core and a specially coloured and, if desired, special grade of outer surface. It is not essential for the metallic carrier 5 to be provided.

It is often specified by motor vehicle manufacturers that a particular pattern of embossing should be applied to the outer surface of trim strips. This can be applied by the outer periphery of the extrusion die aperture being suitably shaped to provide a plurality of grooves on the outer surface of the extrusion and this grooved extrusion can then be passed over a print roller with a knurled surface, the knurling extending generally transverse to the grooves in the extrusion so as to leave the desired pattern on the extrusion, or by other known means.

The extrusion shown in Figure 10 is made with the aid of the extruding apparatus shown in Figure 1 which has an extrusion die 23 having three die plates 25, 27 and 29. The wire carrier 5 enters the apparatus through a flow cone 30 and the plate 25 which is fed with the relatively cheap rubber material 7 by an extruder 31, whereas the sponge rubber material for the sealing portion 3 is fed to the extrusion via the die plate 27 by an extruder 33 and the special rubber material for the outer surface 11 of the extrusion is fed via the die plate 29 by a third extruder 35, the finished product emerging from the apparatus at 37 and passing over an embossing roller 39. The extruders 31 and 33 have to be capable of extruding large quantities of material under considerable pressure, and are hence standard electrically driven machines. However, because the special rubber material, i.e. coloured rubber, for the surface 11 is only to be applied in a very thin layer, and hence its flow rate need only be about 30 lb. per hour, a much cheaper low pressure air driven extruder can be used.

Referring now to Figures 2–9, which show details of the die, the die plates 25 and 27 are largely of the type we use for extruding traditional edge trims with integral seals for motor vehicles. The die plate 25 has a generally L-shaped aperture 41 to receive the material 7, e.g. black rubber, from the extruder 31, the aperture tapering as shown at 43. The aperture is of a suitable size to receive the wire carrier 5 so that the material 7 can be formed around the carrier 5 in known manner and the rear face of plate 25 is connected to the flow cone 30. A mandrel 45 projects from the downstream face of the plate 25 and is suitably shaped and located to define the inner periphery of the sealing portion 3. Furthermore, a portion of the downstream face is cut away as shown at 47 to define an inlet for the sponge rubber material from the extruder 33 for the portion 3, the remainder of this inlet being defined by the upstream face of the die plate 27 which is partly cut away at 48 and apertured at 49 to receive the mandrel 45, with sufficient space around the spigot to enable sealing portion 3 to be extruded in an annular shape. Furthermore, an L-shaped die aperture 51, which is reduced in size in comparison with the aperture 41, is provided in the plate 27 through which the main body of the strip formed of rubber material 7 surrounding the carrier 5 can be extruded, this aperture merging with cut away portion 48. The periphery of the aperture 48 is shaped to define the external shape of sealing portion 3. As can be seen from Figures 3, 4 and 6, the sponge rubber material is forced into the inlet between the plates 27 and 25 and around the spigot 45, the aperture 49 being that much larger than the spigot 45 so as to form the sealing portion 3.

The plates 25 and 27 could largely be used on their own to extrude a standard door seal component of black rubber, but by adding the die plate 29 it is possible to extrude the outer coloured surface 11 onto the material 7. The plate 29 is cut away at 53 to define, with the downstream face of the plate 27, an inlet 55 from the extruder 35 and this inlet communicates with a further reduced size L-shaped die aperture 57, which is in communication with a further aperture 58 for the sealing portion 3. These apertures 57, 58 have dimensions corresponding to the desired dimensions of the extrusion and since the special coloured rubber material fed through the inlet 55 is forced onto the outer surface of the L-shaped body portion, this will cause the rubber material 7 passing through the L-shaped aperture 51 in the plate 27 to be forced into branches 61 of the aperture 57, which forms the gripper fins 9 of the final extrusion. As can be seen from Figures 8 and 9, the plate 29 is also apertured at 58 to receive the spigot 45, this aperture being an extension of the aperture 57.

The three plates are all suitably drilled and threaded and held together by suitable studs, one of which is shown at 63 in Figure 3.

Although the inlets for the sponge rubber material and for the coloured rubber material are shown between the respective die plates, it will be appreciated that they could be drilled in the die plates themselves at almost any location within the die plate provided that the material could be extruded into the correct part of the die.

It will be noticed that there is no divider plate initially to separate the coloured rubber from the solid rubber in the extrusion. This is not wanted because the coloured rubber layer must necessarily be thin, and in any event, the thickness of the layer of coloured rubber can be determined by changing the pressure at which the coloured rubber is extruded through the inlet 55. In fact, if the pressure in the inlet 55 is reduced to nil so that no rubber is being extruded into the die, then the molten black rubber being fed into the die from the extruder 31 will expand into the space allowed for the coloured rubber and the resultant extrusion will be a normal black solid rubber extrusion with an attached sealing portion 3 of sponge rubber. Hence, merely by playing with the pressures in the various extruders, so the properties of the end product can be altered at will without shutting down the machine completely. This means that by using the apparatus disclosed herein, we can manufacture either edge trims according to the invention, or standard ones.

Furthermore, if coloured rubber is being extruded by the extruder 35, it is very simple to change the colour of this rubber merely by feeding a different colour into the extruder. It will of course produce a short length of extrusion of a mixture of colours which is normally scrap. If, however, between colour changes a length of totally black extrusion is required it is merely necessary to turn off the extruder 31.

Instead of using a coloured rubber and the coloured rubber extruder 31, it would be possible to provide a coloured extrusion in accordance with the present invention by using a rubber based paint mixture of a particular colour which can be stored in a chamber above or to one side of the die. This chamber could be fitted with a hand or automatically operated cylinder which could feed the rubber paint mixture to the inlet 55 of the die so that effectively a similar result would be obtained. The metering of the rubber paint mixture can be increased or decreased either by altering the viscosity of the paint mixture or by varying the pressure produced by the cylinder. The expression "polymeric thermosetting material" as used in the appended claims should therefore be suitably interpreted to cover a rubber based paint mixture.

After the product is extruded from the die head its surface can be embossed as desired in known manner and the extrusion is then passed through a vulcanising chamber such as a hot bed of fluidised sand, whereupon the extruded product shown in Figure 8 can be passed through a suitable former to form it into the finished shape shown in Figure 10.

By providing an all rubber extrusion which can be coloured if desired, there is a saving in material, especially over similar part-plastics, part-rubber products where the sealing portion 3 is all rubber and the remainder of plastics. This is because corner forming can be done in one operation whereas previously it was necessary to join the rubber and plastics parts in two separate operations and to take care that the vulcanising of the rubber joints did not damage the thermoplastics material. Also, by forming the product on a single piece of apparatus, there is a further saving of material as there is no separate joining step and naturally the whole process is considerably more efficient than previous processes which need a combining step.

WHAT WE CLAIM IS:—

1. An edge protector trim strip for fitting around a flange on a motor vehicle, the strip having a generally U-shaped cross section and being extruded in one piece from at least two resiliently deformable, polymeric thermosetting materials, one of which forms a major portion of the strip and is arranged, in use, around said flange, and the other of which is of a different colour from said one material, and extends over at least part of the outer surface of said U-shaped strip.

2. An edge protector trim strip as claimed in claim 1 wherein the first material surrounds a resiliently deformable metallic carrier.

3. An edge protector trim strip as claimed in claim 1 or 2 wherein the outer surface is formed of a high grade material such as PVC/Nitrile rubber which may be coloured by pigments, whereas the first material is a material such as EPDM or other polymer which may include up to 60% by weight of fillers.

4. An edge protector trim strip as claimed in any one of the preceding claims wherein a sealing portion extends from an edge portion of the strip.

5. An edge protector trim strip as claimed in claim 4 wherein said seal portion is formed of a third material of thermosetting polymeric nature.

6. An edge protector trim strip as claimed in any one of claims 1—5 which is initially extruded in a generally L-shaped configuration, the longer arm of the L subsequently being deformed to provide a generally U-shaped configuration so that the second material provides the whole of the outer surface of the U except when a sealing portion is provided.

7. An edge protector trim strip as claimed in claim 6 wherein at least two inwardly directed gripper fins are provided on the inner

surface of the extrusion, these fins being extruded with and attached to the flange gripping surface of the second material.

8. An extruded edge protector trim strip substantially as hereinbefore described with reference to and/or as illustrated in the accompanying drawings.

9. A method of producing an edge protector trim strip as claimed in any one of claims 1—8, substantially as hereinbefore described with reference to, or as illustrated in the accompanying drawings.

10. An extrusion die for producti n f a multi-grade edge protector trim strip, as claimed in any one of claims 1—8, said die being substantially as hereinbefore described with reference to and/or as illustrated in Figures 2—9 of the accompanying drawings.

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Sheet 1

Fig. 1.

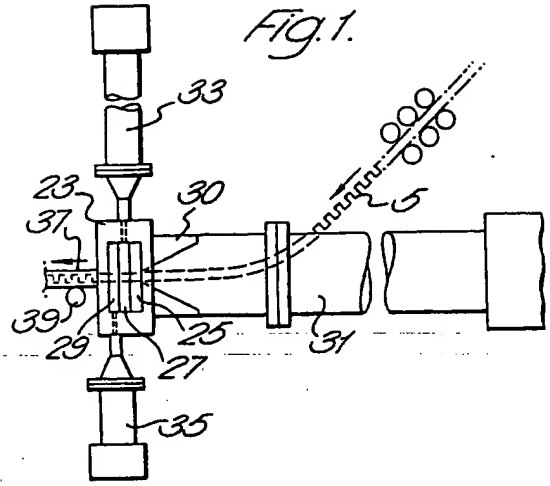
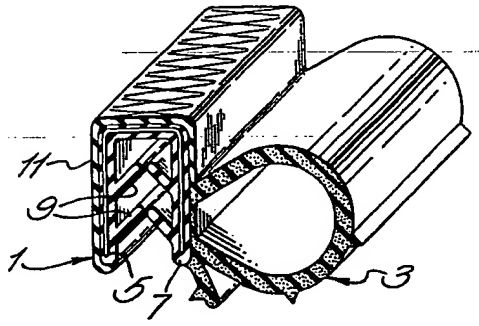


Fig. 10.



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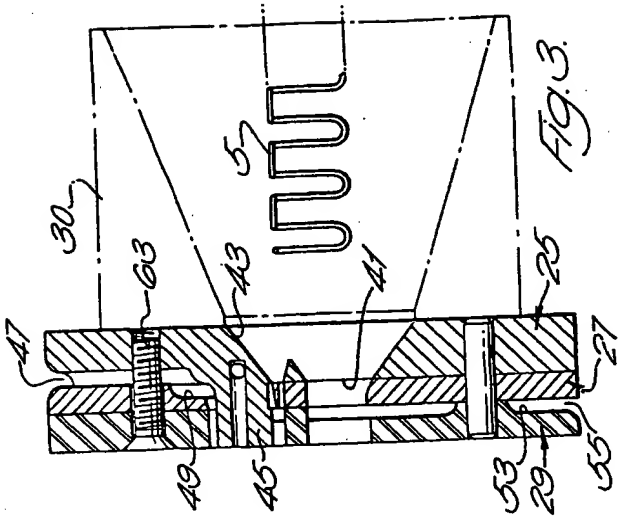
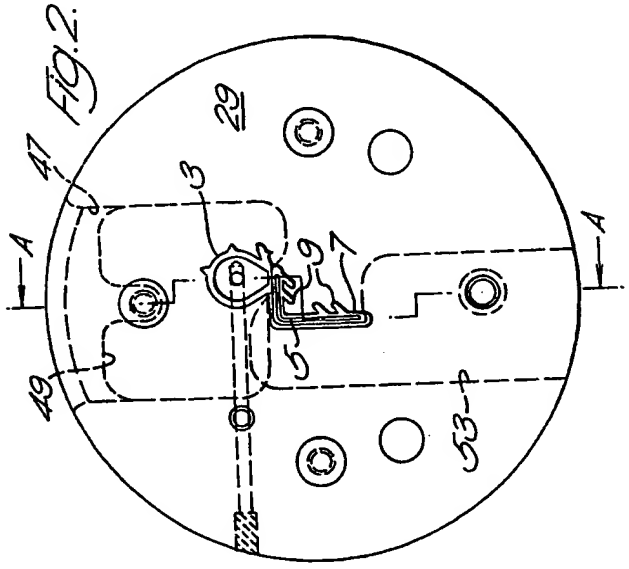


FIG. 3.

FIG. 2.



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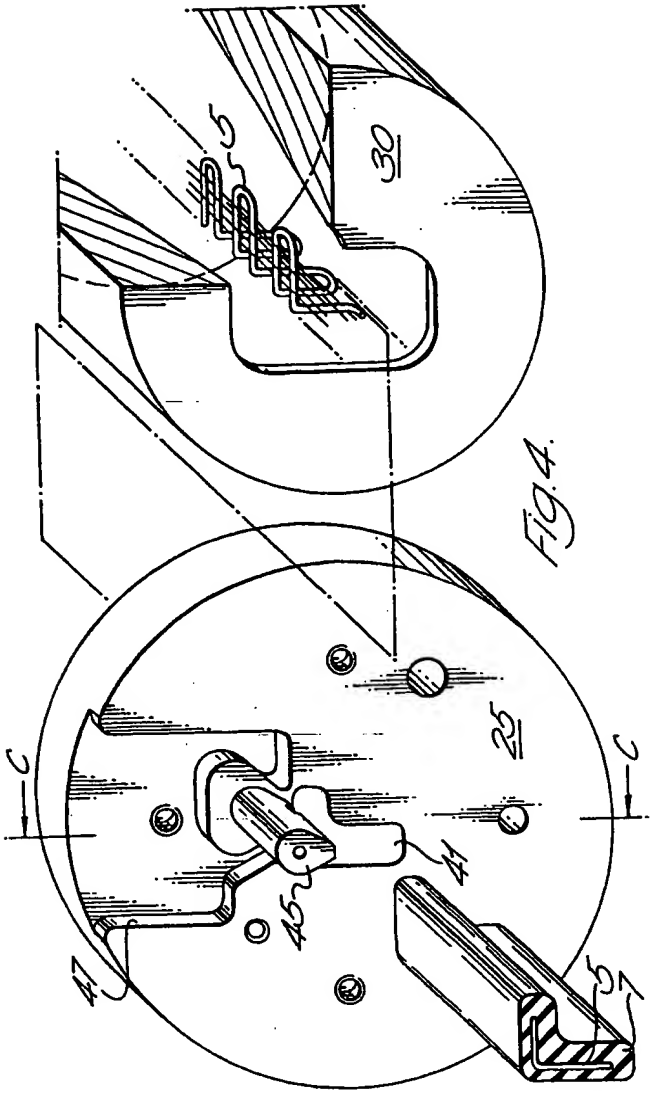

FIG.4.

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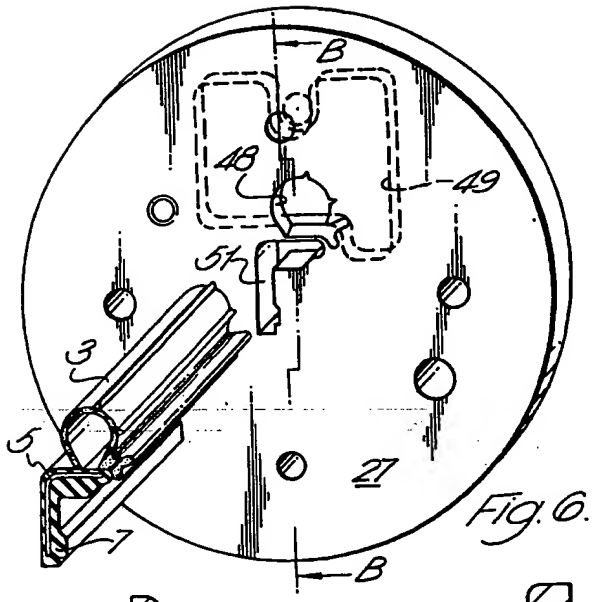

Fig. 6.

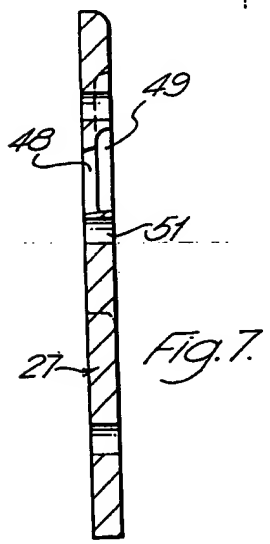

Fig. 7.

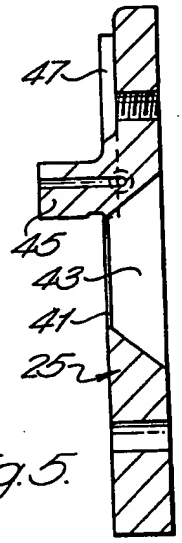

Fig. 5.

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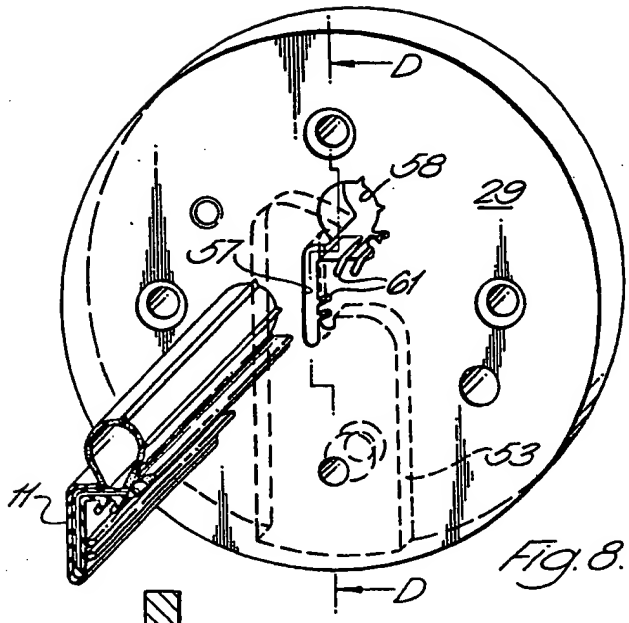

Fig. 8.

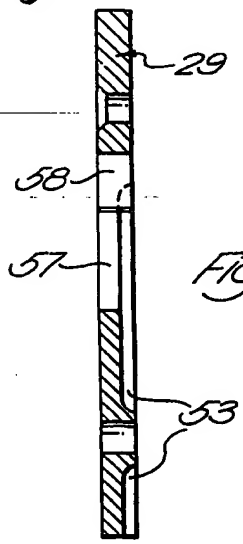

Fig. 9.